

are typically used with both hands and thus they tend to be larger. Alternatively, cell phone handsets are typically used with only one hand, and thus they tend to be smaller. When integrating multiple devices, it is an important task to determine the appropriate footprint of the device. For example, some believe that PDAs are too large for phone use while cell phones are too small for PDA use. Designers generally must consider the primary use of the device and gear the footprint towards that use. Although there are different footprints, there are typically minimum and maximum footprints. If the footprint is too large or too small, the device may be difficult to use.

[0056] Because of their size, the smaller devices are typically placed in a pocket while the larger devices are not. A media player is one example of a hand-held device that is sized for placement into a pocket of the user. By being pocket-sized, the user does not have to directly carry the device and therefore the device can be taken almost anywhere the user travels (e.g., the user is not limited by carrying a large, bulky and often heavy device, as in a laptop or notebook computer).

[0057] Generally it is preferred, although not necessary, that hand-held devices of the type disclosed herein have dimensions of about 5 in×3 in×1 in and perhaps about 4.1 in×2.4 in×0.75 in.

C. Full Screen Display

[0058] Because the footprint of a multifunctional hand-held device is substantially fixed by the intended primary use of the device, it becomes important for designers to determine an appropriate layout for the UI. For example, some devices may work better with a limited number of buttons and a large display while others may work better with a large number of buttons or a complete keyboard and a small display.

[0059] A preferred multi-functional hand-held device may be configured with a full screen display or a near full screen display. A full screen display consumes substantially the entire front surface of the device. The display may extend edge to edge or may fit within a small bezel of the housing at the edge of the device. The full screen display may consume 90% or more of a front surface of a housing for a hand-held electronic device.

[0060] The full screen display may have a variety of different configurations depending on the overall footprint of the device. If the device is wide, the full screen display may have a traditional aspect ratio of about 4:3. If the device is elongated, the full screen display may have an aspect ratio that is more panoramic such as 16:9.

D. Limited Number of Mechanical Actuators

[0061] To accommodate a full screen display, the multifunctional hand-held device is preferably configured with a limited number of physical buttons. Because a limited number of physical buttons are provided, the hand-held device preferably uses a touch screen as the primary input device. Touch screens are transparent touch sensing devices that are positioned over displays. They typically work in conjunction with a GUI presented on the display. For example, the GUI may present an on-screen button, and the touch screen may detect when a user presses the on-screen

button (e.g., places their finger or stylus over the on-screen button). Touch screens and GUI's are described in greater detail below.

[0062] The hand-held device may be constructed with only cross-functional physical buttons, i.e., there are no buttons dedicated to individual devices. These type of buttons may include power buttons and hold switches. In another embodiment, the hand-held device may not include any physical buttons at all. In some embodiments, the physical buttons are limited to only the sides and back surface of the hand-held device. In other embodiments, the physical buttons of the hand-held device are limited to the upper and lower portion of the sides so that there are no buttons in the regions of the sides where a user would physically support the device (i.e., holding region). In still other embodiments, the physical buttons may be located on the front surface, but only in the bezel region surrounding the display. In some embodiments, the buttons may be located on only the top and bottom surfaces of the device.

[0063] FIG. 3 is a perspective view of a substantially full screen multi-functional hand-held device 120 with a limited number of buttons. There are no physical buttons on the front and side surfaces 124 and 126. The front surface is used entirely for the display 122. Further, because the sides 126 are used for grasping the device 120 it may be preferred to leave the sides free from buttons to prevent accidental actions in the event a user inadvertently presses a button while supporting the device. Although the top surface 128 and bottom surface 130 would not typically be used to hold the device, these surfaces are not ideal locations for buttons that are often actuated because it would be awkward to reach these buttons when operating the device with one hand.

[0064] The top surface 128 may be reserved for buttons that have limited action and generic functions that are cross-functional, for example, power and hold switches. The top and bottom surfaces 128 and 130 are also well suited for placement of I/O and communication ports. The top surface 128 may, for example, include a headset/microphone jack and an antenna, and the bottom surface 130 may include power and data ports.

[0065] In some cases, it may be desirable to place buttons in the upper or lower regions of the side surfaces 126 out of the way of the grasping hand. This may be particularly well suited for elongated devices that are larger than the width of the grasping hand. As shown in FIG. 4, the hand-held device 120 includes a button 140 in the upper region on the side surface 126 of the hand-held device 120. Because the button 140 is in the upper region, it tends to be out of the way of the grasping hand and therefore accidental activation is substantially eliminated. The upper button may be configured to switch the functionality of the multi-functional device i.e., button 140 may be switch 110 of FIG. 2. For example, by pressing the button 140, a new device functionality is activated, and the current device functionality is deactivated. Although the term button is used, it should be appreciated that the button 140 may correspond to a dial, wheel, switch and/or the like.

[0066] Generally it would be preferred, although not required, to limit the number of physical buttons to eight or fewer, and perhaps five or fewer.